

Examine Metadata

DataSource	SiteName	VarName	SiteCode	VarCo
EPA	CAYUGA CREEK IN Cheektowaga	Inorganic nitrogen (nitrate and nitrite) as N	EPA:21NYDECA:...	EPA:3:
EPA	CAZENOVIA CREEK In Buffalo	Inorganic nitrogen (nitrate and nitrite) as N	EPA:21NYDECA:...	EPA:3:
EPA	BUFFALO R. IN BUFFALO	Inorganic nitrogen (nitrate and nitrite) as N	EPA:21NYDECA:...	EPA:3:
EPA	MUD CREEK IN RAYMOND	Inorganic nitrogen (nitrate and nitrite) as N	EPA:21NYDECA:...	EPA:3:
NWISIID	NI1093	NH3+orgN, wf	NWISIID:431500...	NWISI
NWISIID	E2642	NH3+orgN, wf	NWISIID:425749...	NWISI
EPA	BUFFALO R. IN BUFFALO	Nitrite as N	EPA:21NYDECA:...	EPA:1
NWISIID	NI1093	Nitrite, wf	NWISIID:431500...	NWISI
NWISIID	E2642	Nitrite, wf	NWISIID:425749...	NWISI
NWISIID	E2642	Nitrite, wf	NWISIID:425749...	NWISI
EPA	CAYUGA CREEK IN Cheektowaga	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
EPA	MUD CREEK IN RAYMOND	Nitrogen, Kjeldahl	EPA:21NYDECA:01	EPA:3:
EPA	TONAWANDA CREEK IN Rapids	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
EPA	CAZENOVIA CREEK In Buffalo	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
EPA	BUFFALO CREEK In Gardenville	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
EPA	BUFFALO RIVER in Buffalo	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
EPA	RANSOM CREEK IN CLARENCE	Nitrogen, Kjeldahl	EPA:21NYDECA:...	EPA:3:
NPCA	FR001	Nitrogen, nitrate (NO3)	NPCA:FR001	NPCA:
NPCA	WR010	Nitrogen, nitrate (NO3)	NPCA:WR010	NPCA:
NPCA	WW001	Nitrogen, nitrate (NO3)	NPCA:WW001	NPCA:

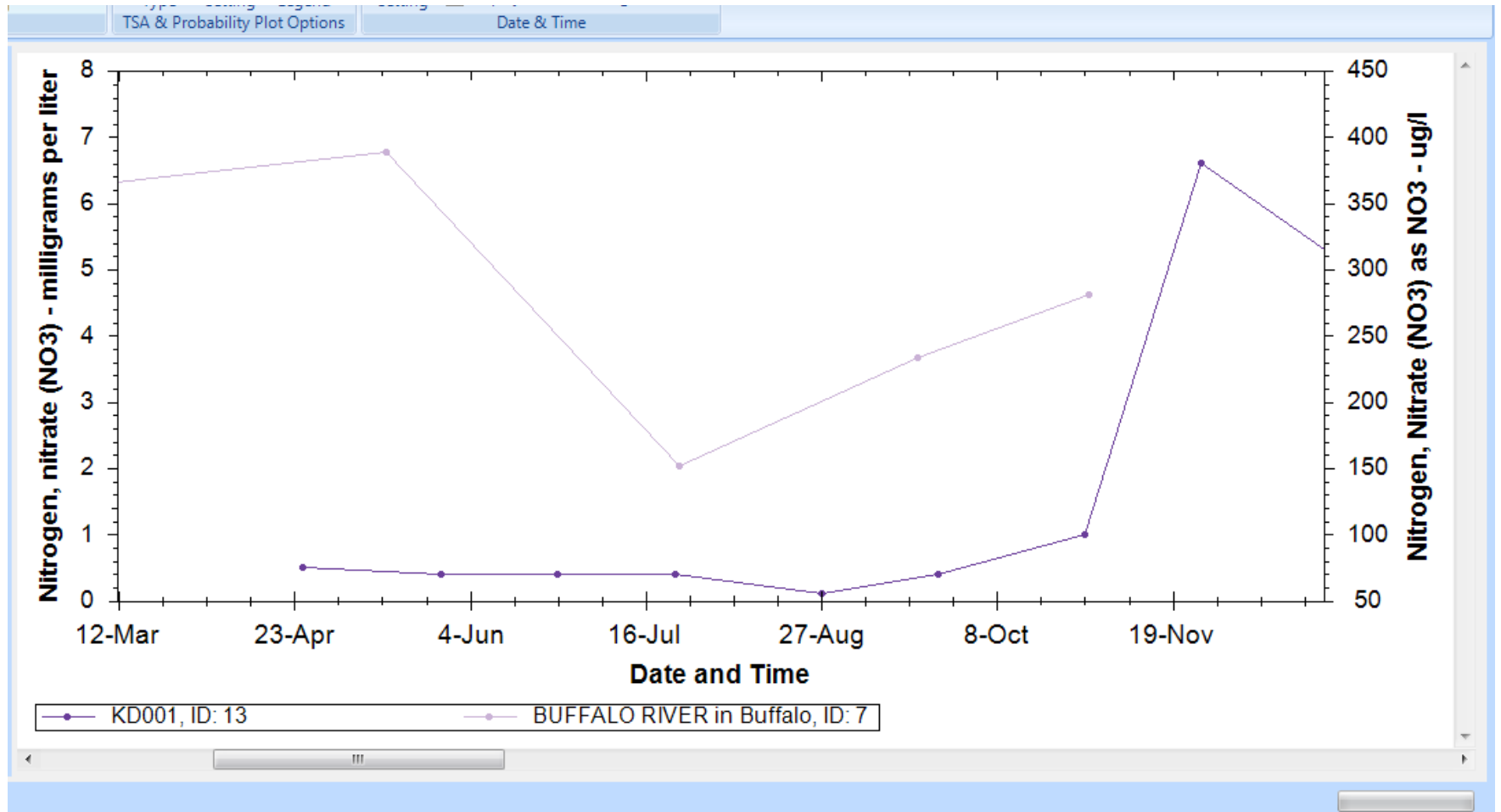
Select Series for Download

The screenshot displays the CUAHSI HydroDesktop application window. The interface includes a menu bar (Home, Table, Graph, Edit, Help) and a toolbar with various map tools (Search, Pan, Zoom In, Zoom Out, MaxExtents, Previous, Next, Add, Identify, Select, Attribute, Measure, Delineate, EPA Tool, Online Basemap). The main map area shows a satellite view of the Niagara River region with numerous data points overlaid. On the left, the 'Map Layers' panel lists several layers: 'Search Results' (checked), 'EPA' (red square), 'NPCA' (green square), 'NWISDV' (blue triangle), 'NWISIID' (blue triangle), 'NWISUV' (blue triangle), 'Themes' (checked), 'Niagara Tribs' (checked), 'NPCA' (green square), 'NWISUV' (blue triangle), 'Online Basemap' (checked), 'Base Map Data' (checked), 'lakes' (checked), 'rivers' (checked), 'U.S. HUC' (checked), 'U.S. Counties' (checked), 'Canada Province' (checked), 'NAME' (checked), 'U.S. States' (checked), 'NAME' (checked), and 'Countries' (checked). On the right, the 'Search Results' panel shows 15 out of 438 series selected. The table below lists the selected series:

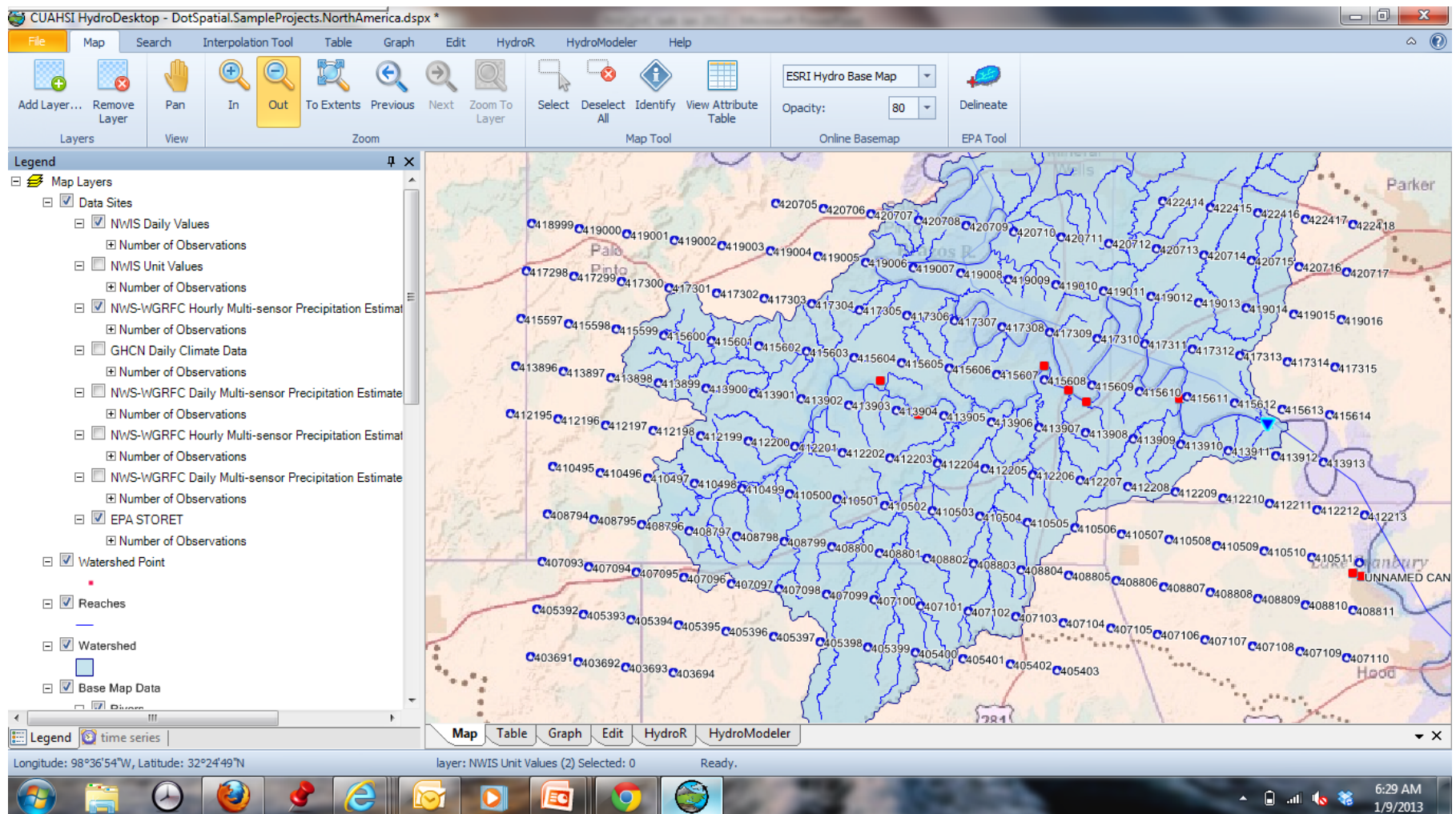
DataSource	SiteName	VarName
EPA	CAYUGA CREEK...	Inorganic nitroge...
EPA	CAYUGA CREEK...	Nitrogen, Kjeldahl

Below the table, there are options to 'Save data to...' (New Theme, Existing Theme) and a 'Download Data' button. The 'Search Summary' panel on the right provides additional information: Server: HIS Central, Area: Rectangle :: -79.569171 :: 42.835297 :: -78.523153 :: 43.256908, Web Services: All Webservices selected, Keywords: Discharge, stream :: Coliform, fecal :: Nutrient :: Atrazine, Date Range: 6/15/2006 :: 6/15/2011. A 'Run Search' button is located at the bottom right of the search results panel. The status bar at the bottom shows the coordinates: Longitude: 79°04'18"W, Latitude: 42°52'11"N.

View Data



Gridded Data as “Virtual” Gages



GIS fully integrated with HIS

The screenshot displays the CUAHSI HydroDesktop application window. The title bar reads "CUAHSI HydroDesktop - default.hdpj". The interface includes a menu bar (Home, Table, Graph, Edit, Help) and a toolbar with icons for Search, Pan, Zoom In, Zoom Out, MaxExtents, Previous, Next, Add, Identify, Select, Attribute, Measure, and an Online Basemap button. On the left, a "Map Layers" panel lists various data layers: "Search Results" (expanded), NWISDV, Themes, Online Basemap, Base Map Data (with sub-layers for lakes and rivers), U.S. HUC (with sub-layers for HUC and NAME), U.S. Counties (with sub-layers for NAME), U.S. States (with sub-layers for NAME), Canada Provinces (with sub-layers for NAME), and Countries (with sub-layers for NAME). The central map area shows a topographic map of a region in Texas, with blue triangles indicating specific data points. On the right, a "Keywords" panel is open, showing a search for "Discharge, stream". It lists related keywords such as "Discharge velocity", "Discharge, ground", "Discharge, in conc", "Discharge, per bat", "Discharge, stream", "Discharge, unspec", "Discharge, well flo", "Dispo uncinata", and "Dissolved Gas". A "Keywords Display" section shows "List", "Tree", and "Both" options. Below this, a "Selected Keywords" section lists "Discharge, stream". At the bottom right, a "Run Search" button is visible. The status bar at the bottom left shows "Longitude: 97°23'39\"W, Latitude: 30°23'28\"N".

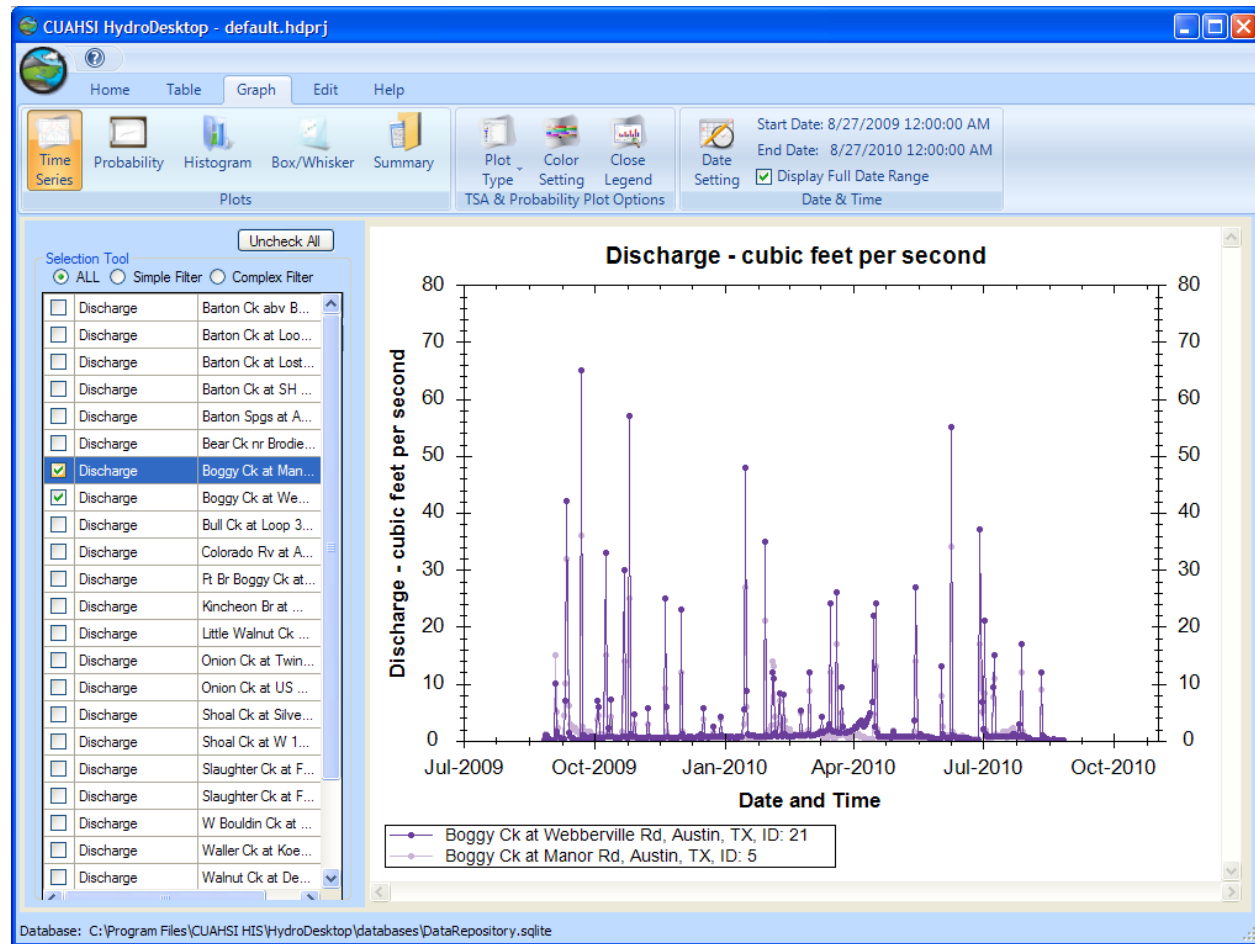
- Metadata catalog
- Ontology keywords
- WaterOneFlow/WaterML

Discovery
Access
Analysis

Run Search

Built-in Analysis

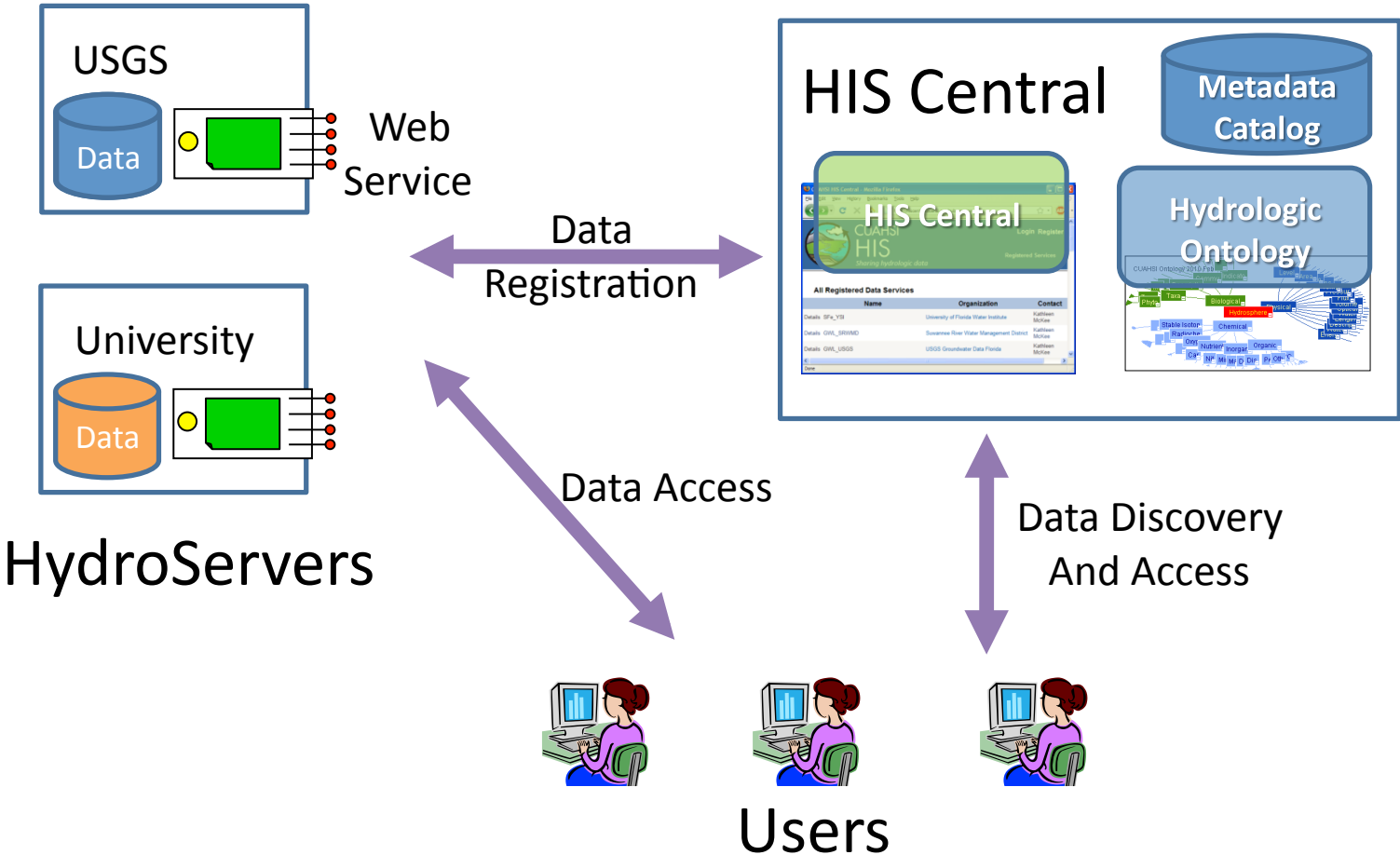
- Tables
- Graphs
- Editing
- Export



The screenshot displays the data.cuahsi.org web application. The top navigation bar shows the URL and search filters: "Between 2000-01-01 and 2013-01-09". The main content area features a map of the Washington, D.C. region, densely populated with orange location pins. On the left side, there is a sidebar with the heading "Available Data" and several filter categories: "Sample Medium (5 options)", "Organization (4 options)", "Variable Name (1287 options)", "Data Type (3 options)", "Value Type (4 options)", and "Network (7 options)". Below these filters is a "Search" button. A text box below the search button states: "Showing sites of data where Data Type equals Instantaneous, or Sporadic, or Continuous on the map." The map itself shows major highways like the Capital Beltway (I-495) and the Potomac River, with numerous orange pins indicating data collection sites across the region.

Use Chrome browser; for demonstration only

HIS System – HydroServer

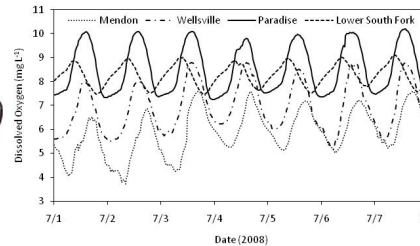


HydroServer Goals

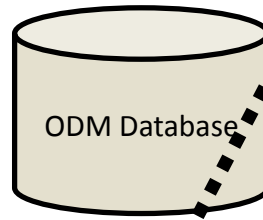
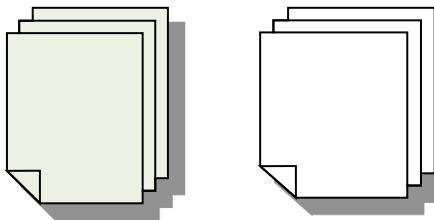
- A platform for publishing space-time hydrologic datasets that:
 - Provides local control of data
 - Makes data universally available
 - Is open source (hydroserver.codeplex.com)

Point Observations Data

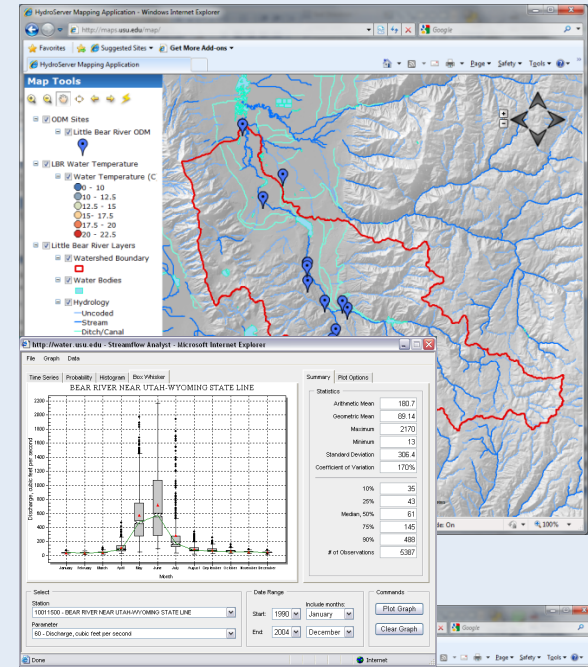
Ongoing Data Collection



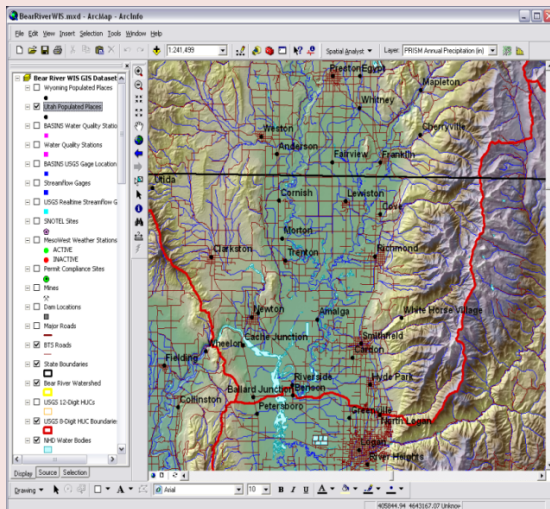
Historical Data Files



Internet Applications



GIS Data



GetSites
GetSiteInfo
GetVariableInfo
GetValues

WaterML

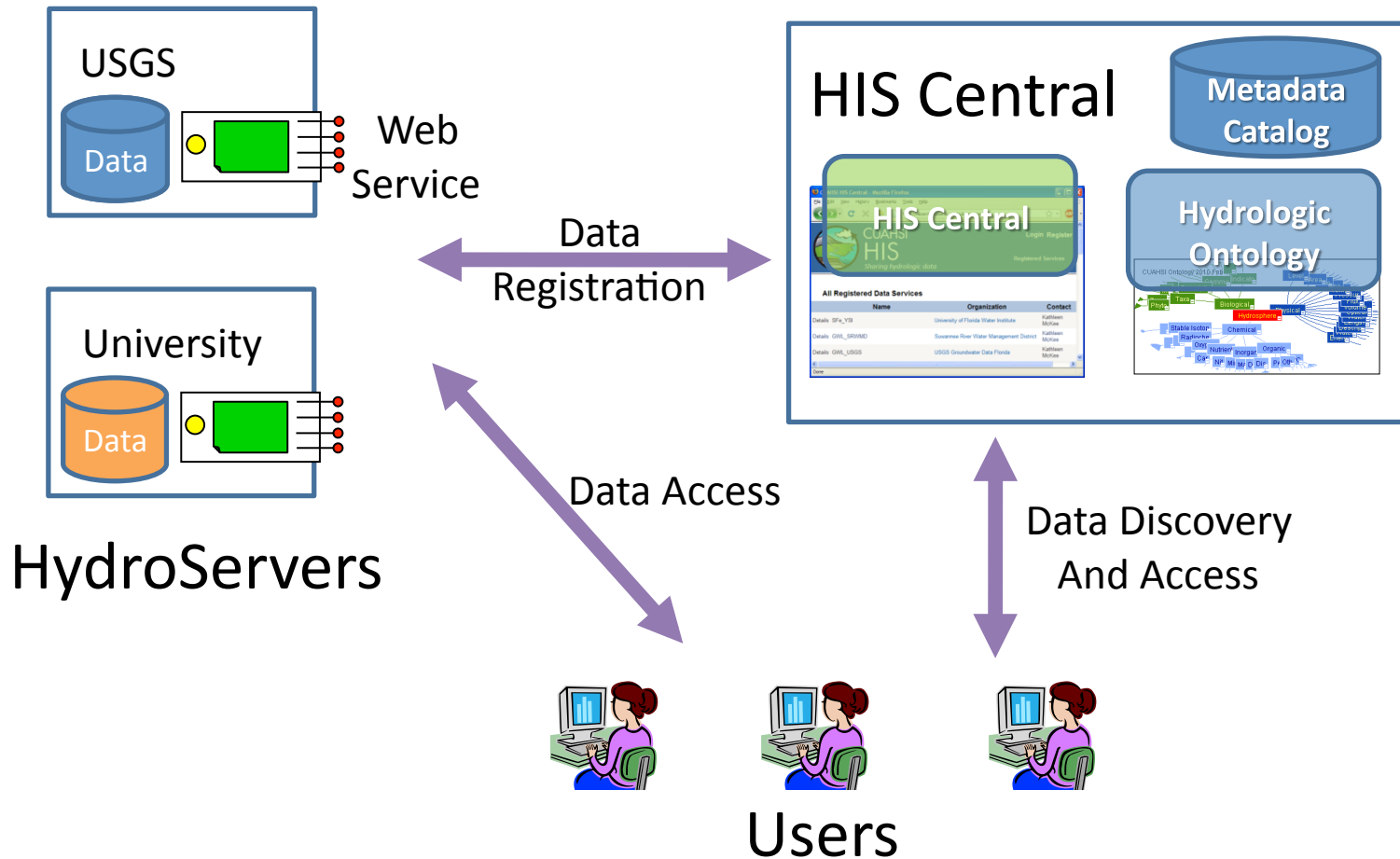
WaterOneFlow
Web Service

ArcGIS Server

HydroServer

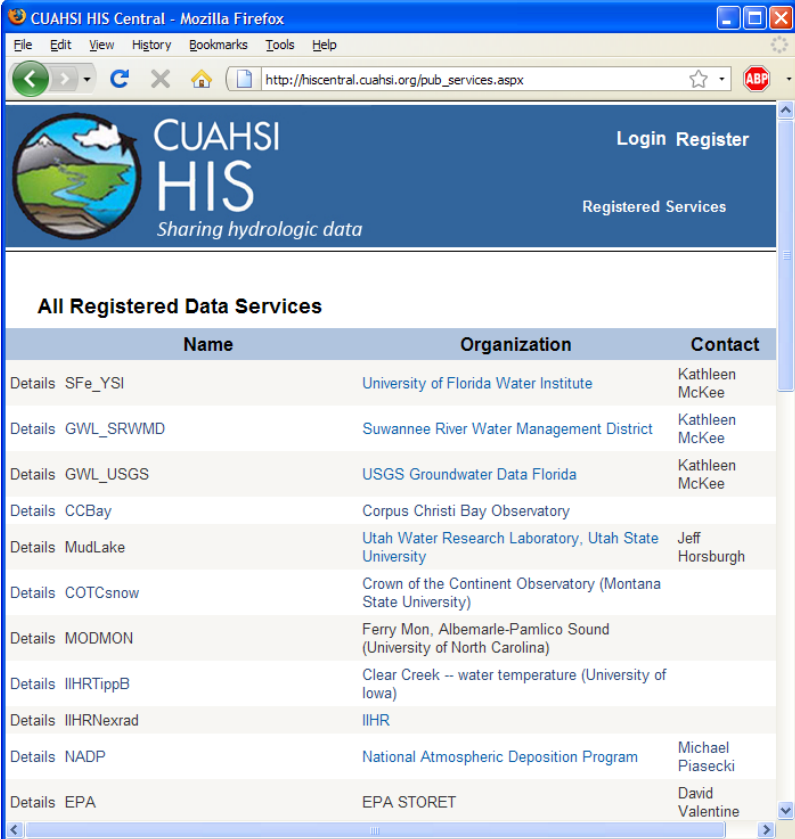
Data presentation, visualization,
and analysis through Internet
enabled applications

HIS System – HIS Central



HIS Central

- Publishers
 - Register a data service
- Users
 - Find a data service
- Supported by
 - Metadata Catalog
 - Hydrologic Ontology



CUAHSI HIS Central - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://hiscentral.cuahsi.org/pub_services.aspx

CUAHSI HIS
Sharing hydrologic data

Login Register

Registered Services

All Registered Data Services

Name	Organization	Contact
Details SFe_YSI	University of Florida Water Institute	Kathleen McKee
Details GWL_SRWMD	Suwannee River Water Management District	Kathleen McKee
Details GWL_USGS	USGS Groundwater Data Florida	Kathleen McKee
Details CCBay	Corpus Christi Bay Observatory	
Details MudLake	Utah Water Research Laboratory, Utah State University	Jeff Horsburgh
Details COTCsnow	Crown of the Continent Observatory (Montana State University)	
Details MODMON	Ferry Mon, Albemarle-Pamlico Sound (University of North Carolina)	
Details IIHRTippB	Clear Creek -- water temperature (University of Iowa)	
Details IIHRNexrad	IIHR	
Details NADP	National Atmospheric Deposition Program	Michael Piasecki
Details EPA	EPA STORET	David Valentine

<http://hiscentral.cuahsi.org>

Metadata Catalog

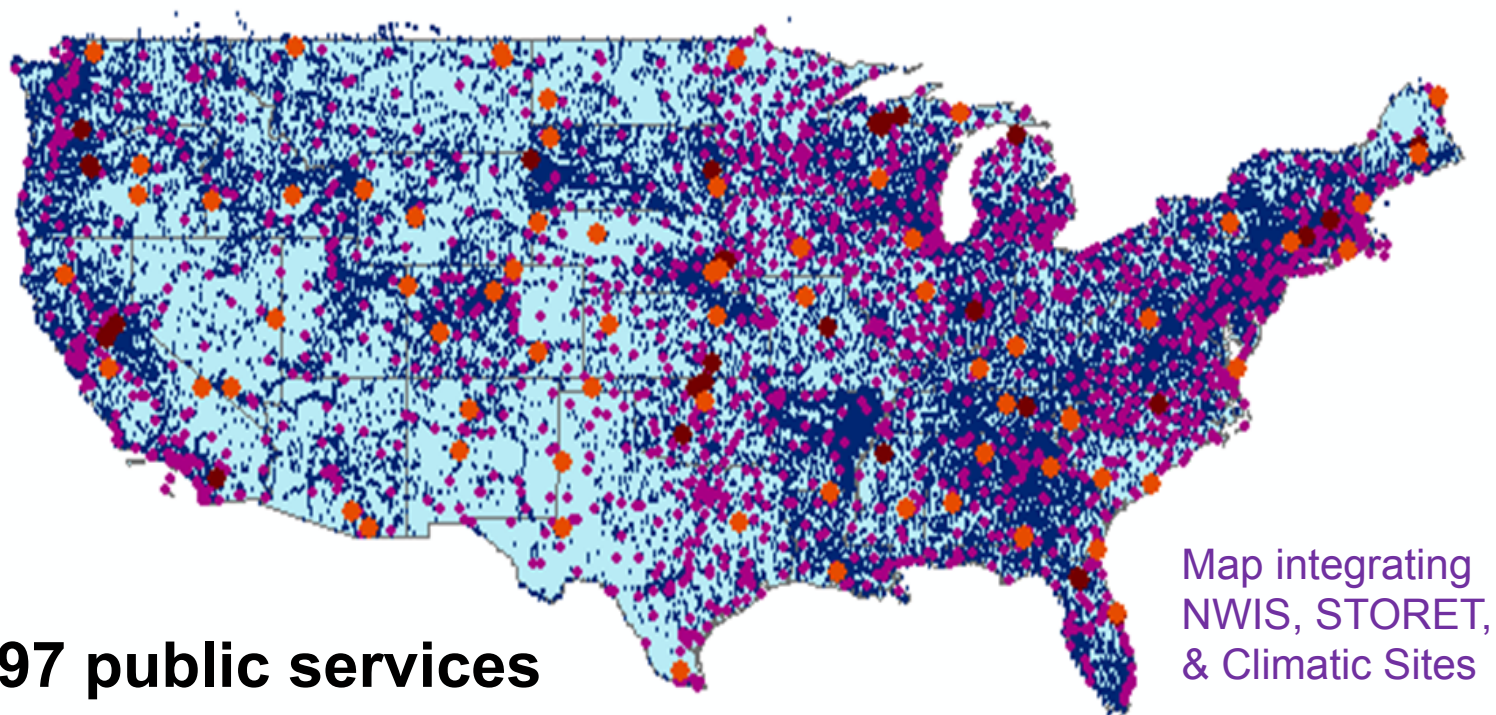
Stores description of time series, e.g.,

*The **USGS** measures **streamflow** at **Waller Creek & Koenig** with data from **7/31/1968** to the **present...***

...and you can get the data from [here](#).

Registered services harvested weekly

Metadata Catalog, October, 2012

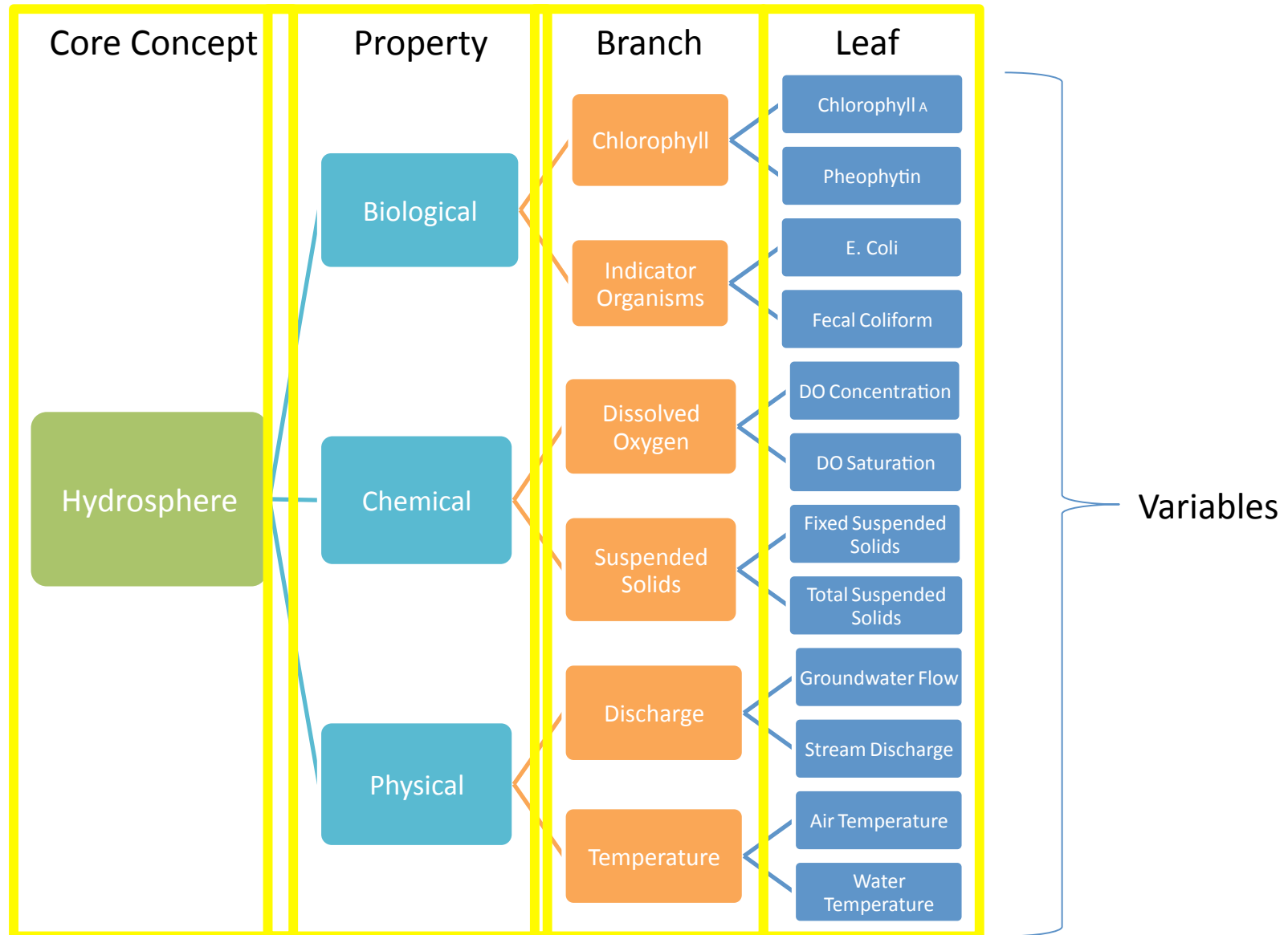


97 public services
32,000+ variables
2.79 million sites
33.9 million series
Referencing 18+ billion data values

Ontology: Conceptual Framework

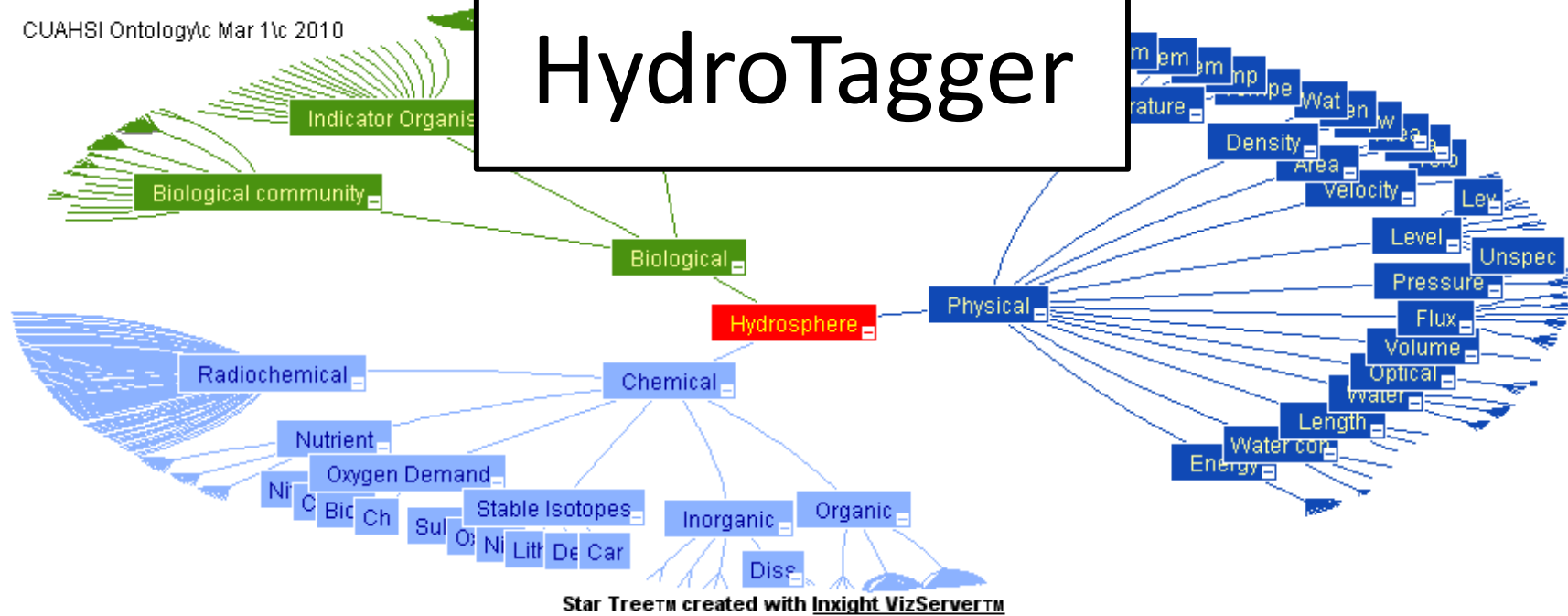
- **Chemical** descriptions from **EPA/USGS Substance Registry System**
<http://www.epa.gov/srs/>
- **Physical** descriptions from **CF Conventions**
 - NetCDF Climate & Forecast; 137 variables
<http://cf-pcmdi.llnl.gov/>
- **Biological** descriptions from **Integrated Taxonomic Information System**
<http://www.itis.gov/>

Thematic Concepts



CUAHSI Ontology/c Mar 1/c 2010


HydroTagger



Variable Name	Code	Medium	Variable:	Variable	Keyword	
sampling depth, feet	nwisuv:00003	unknown	Temperature, Water, Degree	gage height, feet	water depth, stream	delete
sample accounting number	nwisuv:00008	unknown	Mapping:	discharge, cubic feet per second	discharge, stream	delete
location in cross section...	nwisuv:00009	unknown	Temperature, water	barometric pressure, not corrected to sea level, millibars	atmospheric pressure	delete
temperature, water, degr...	nwisuv:00010	unknown	Map!	acoustic signal strength, units		delete
temperature, water, degr...	nwisuv:00011	unknown				

Each **Variable** in your data is connected to a corresponding **Concept**

HIS Central Web Page




**CUAHSI
HIS**
Sharing hydrologic data

Login Register

Home All Data Services

All Registered Data Services

Data Service Title	Observation Name
Baltimore Precipitation	BaltPrecip
Baltimore Ecosystem Study Stream Chemistry Data	BESOD
Baltimore Ecosystem Study Soils Data	BESSoil
Baltimore Waters Test Bed Ground Water Level Data	BaltimoreGW
Beacon Institute for River and Estuary	BEACON_IBM
Dry Creek Experimental Watershed, SW Idaho	ODMDCEW
Chesapeake Bay Information Management System	CIMS



**CUAHSI
HIS**
Sharing hydrologic data

Login Register

Home All Data Services

Dry Creek Experimental Watershed, SW Idaho



Boise State University, Hydrologic Sciences Department
ODMDCEW2

http://icewater.boisestate.edu/dcew2dataservices/cuahsi_1_0.asmx?WSDL

Contact: Pam Aishlin
pamaishlin@boisestate.edu
208-426-2220

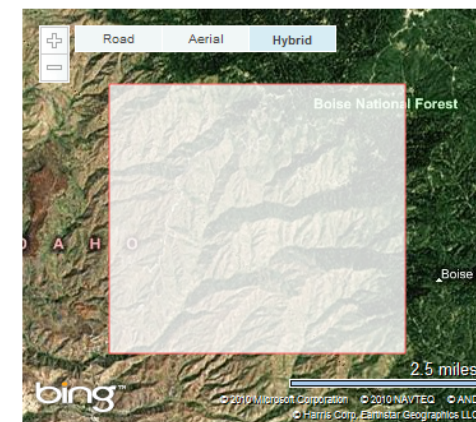
Service Statistics:

Sites: 68	Geographic Extent: 43.74071
Variables: 24	-116.1786 -116.099
Values: 4738590	43.68834

Last Harvested on 7/25/2010 1:12:50 PM

Abstract

Dry Creek Experimental Watershed was established by Dr. Jim McNamara in 1998 as an outdoor laboratory for student and faculty research toward improving understanding of hydrologic processes in semi-arid mountainous terrain and testing and improving data integration and hydrologic modeling. Continuous and discrete data collection includes climate, surface water, groundwater and soil



Citation

Boise State University, Hydrologic Sciences Dept,
Dr. Jim McNamara

<http://hiscentral.cuahsi.org>

HIS Central *Web Service*

- Programmatic methods to query the national metadata catalog
- Search by:
 - Location
 - Variable (concept)
 - Date Range
 - Data source (WaterOneFlow service)

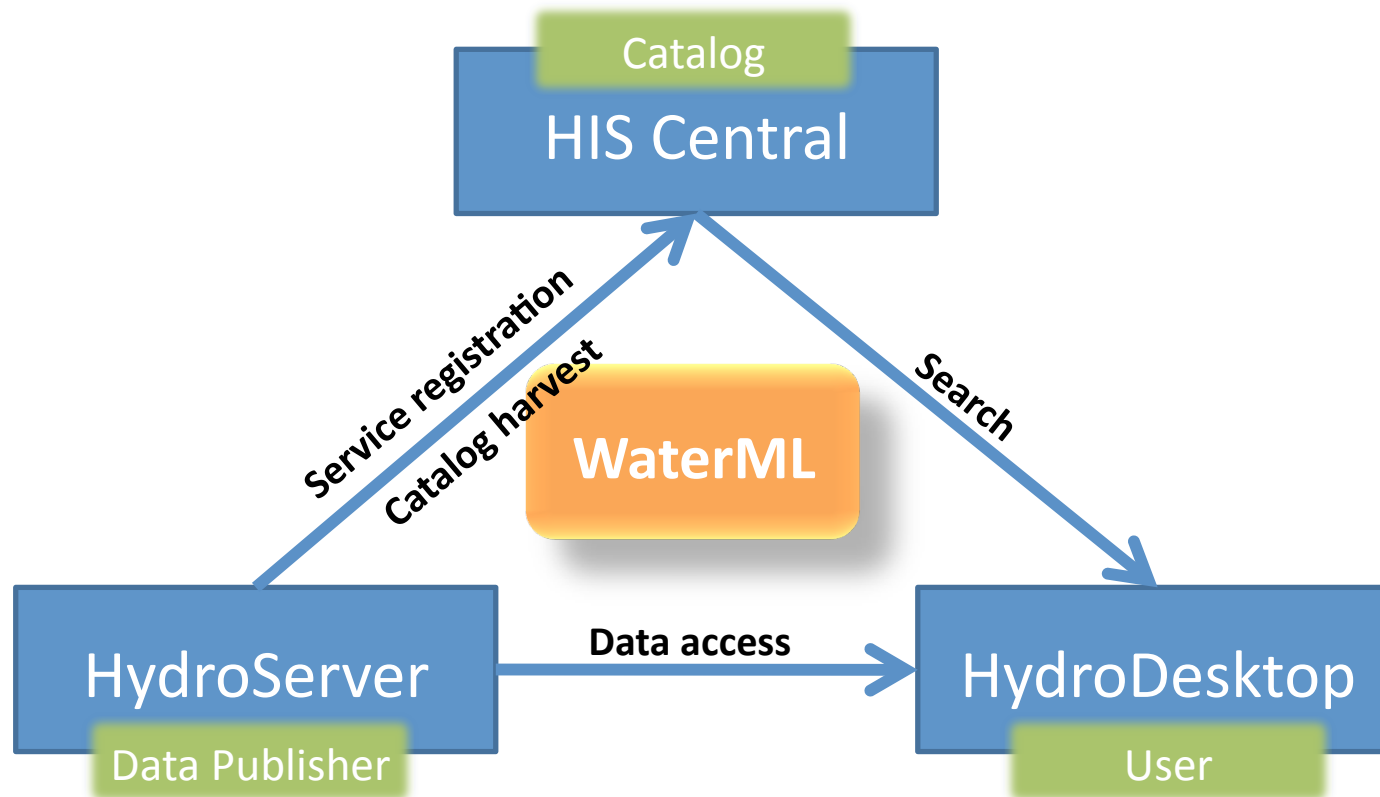
hiscentral

The following operations are supported. For a formal definition, please review the [Service Description](#).

- [GetMappedVariables](#)
- [GetMappedVariables2](#)
- [GetSearchableConcepts](#)
- [GetSeriesCatalogForBox](#)
- [GetSeriesCatalogForBox2](#)
- [GetServicesInBox](#)
- [GetServicesInBox2](#)
- [GetSitesInBox](#)
- [GetSitesInBox2](#)
- [GetWaterOneFlowServiceInfo](#)
- [GetWordList](#)
- [getOntologyTree](#)
- [getSearchablePaths](#)
- [getSeriesCatalogInBoxPaged](#)

<http://hiscentral.cuahsi.org/webservices/hiscentral.asmx>

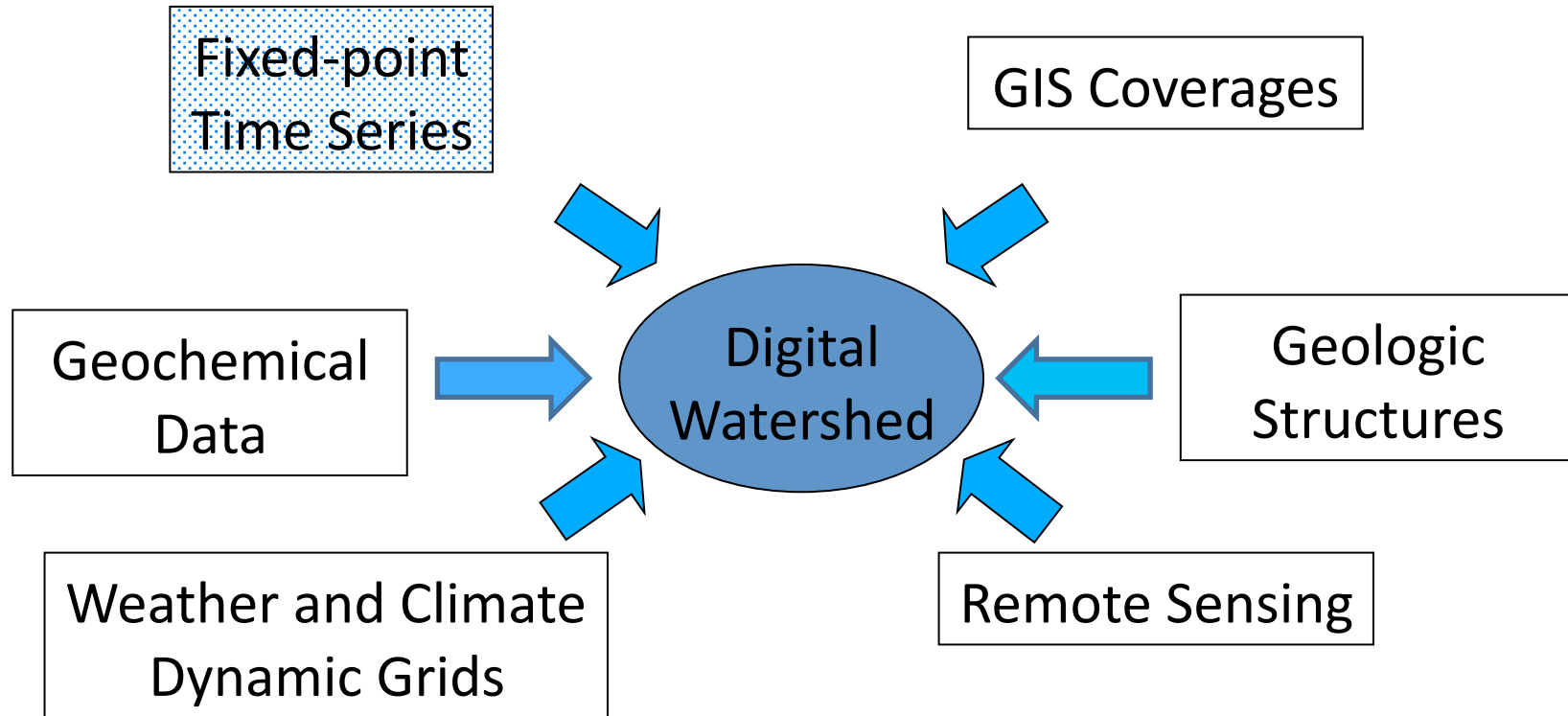
Services-Oriented Architecture for Water Data



The Road Ahead – WaterML 2.0

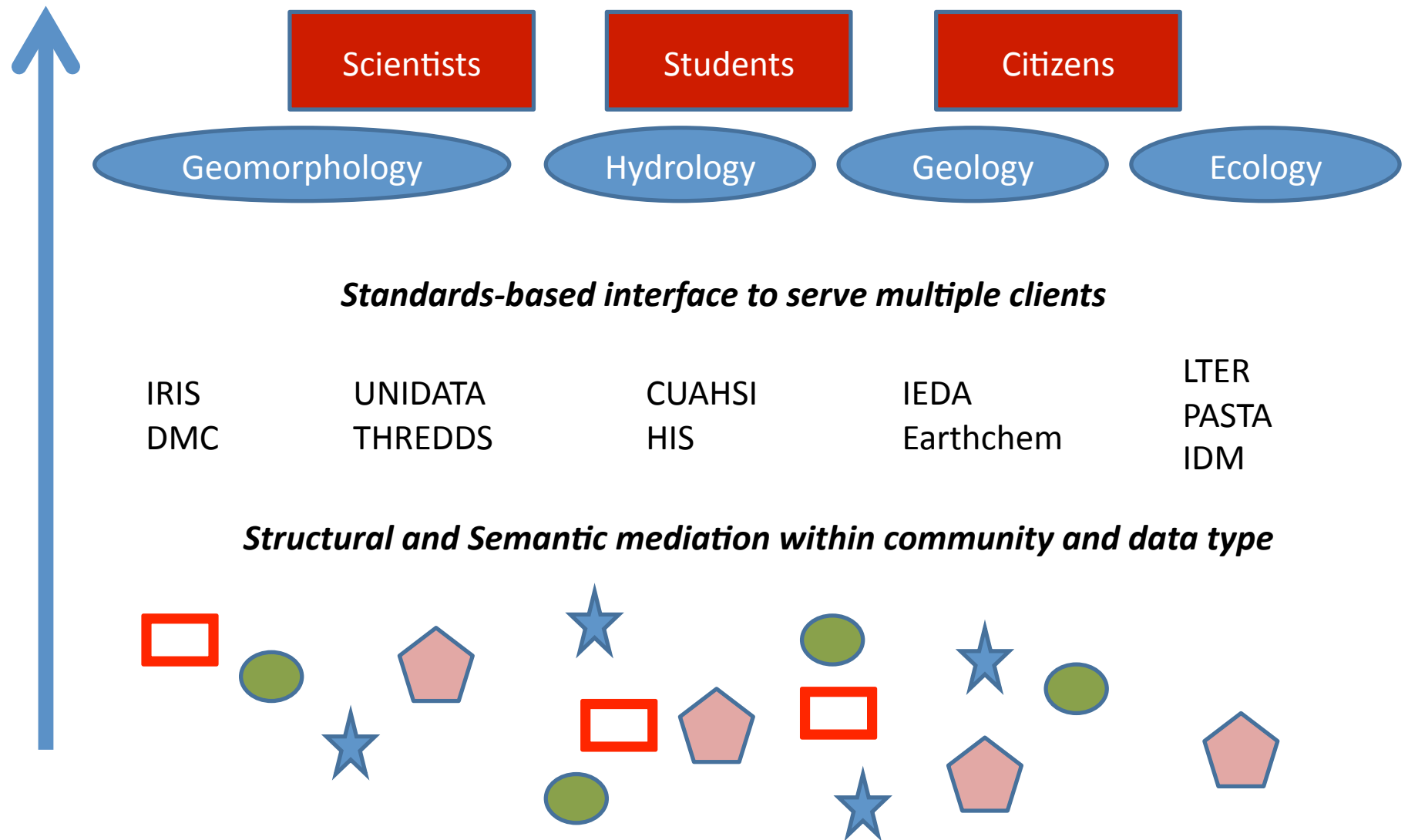
- CUAHSI Water Data Center
 - Recommended for funding at NSF
 - \$800K/yr for 3 yr start-up
- Broader collaboration
 - Hydrology Domain Working Group
 - World Meteorological Organization
 - Open Geospatial Consortium (OGC)
- Towards an international standard
 - OGC standard adopted, July, 2012
 - WMO initiate process to accept as standard Nov., 2012

Data Integration



Currently, the focus is on data from monitoring sites at point locations.

Multiple Services, Multiple Clients within a Standards-Oriented Environment



Start Using HIS!

- HIS Website
 - cuahsi.org/his.aspx
 - cuahsi.org/hydrodesktop.aspx
- User Support available through CUAHSI
- Contribute to software development

